CLAIMS

We claim:

1. A method of forming a semiconductor device, the method comprising:

defining an electrode on a substrate;

forming a spacer adjacent to at least one sidewall of the electrode;

performing a processing operation on the substrate, the processing operation using the spacer as a mask and creating a layer on the spacer; and

removing the spacer, wherein removing the spacer comprises:

applying a first dry etch process to remove the layer on the spacer, the first dry etch utilizing a fluorine-contained plasma; and

applying a second wet etch process to remove the spacer.

2. The method of claim 1 wherein the step of removing the spacer further comprises:

applying a third wet etch process to remove an oxide layer underlying the spacer.

3. The method of claim 1 wherein the processing operation is an ion implantation process.

4. The method of claim 1 wherein the first dry etch process is a plasma etch process.

5. The method of claim 1 wherein the first dry etch process uses perfluorocarbon gas taken from the group consisting of: CF_4, CHF_3, CH_2F_2, or CH_3F.

6. The method of claim 1 wherein the second wet etch process uses an etchant taken from the group consisting of: H_3PO_4 and HF acid.

7. The method of claim 1 wherein the first dry etch process uses a plasma etch with a radio frequency (RF) power in the range of 150 ~ 1500W.

8. The method of claim 1 wherein the first dry etch process uses a plasma etch with a temperature less than 500°C and a pressure less than 300 mTorr.

9. The method of claim 1 wherein the step of forming a spacer adjacent to at least one sidewall of the electrode forms a silicon nitride spacer by chemical vapor deposition.

10. The method of claim 9 wherein the spacer is formed on a silicon oxide layer.

11. The method of claim 1 wherein the first dry etch process is an ashing process utilizing oxygen and a fluorine-contained plasma.

12. A semiconductor device having a lightly doped region , the device comprising:

a substrate;

an electrode formed on the substrate;

a first region in the substrate that is relatively deep and spaced a first distance from the electrode; and

a second region in the substrate that is relatively shallow and spaced a second distance from the electrode, the second distance being less than the first, the second region being produced through use of a disposable spacer positioned adjacent to a side wall of the electrode;

wherein the silicon substrate remains undamaged by a phosphoric acid process used to remove the spacer.

13. A system for fabricating a lightly doped drain (LDD) region on a semiconductor substrate, the system comprising:

means for creating a spacer;

first means for implanting a first relatively heavily doped region with the spacer in place;

one or more chambers for removing the spacer, the one or more chambers configured for:

applying a first dry removal process to remove the layer on the spacer, the first dry removal process utilizing a fluorine-contained plasma; and

applying a second wet etch process to remove the spacer; and

second means for implanting the LDD region with the spacer removed.

14. The system of claim 13 wherein the one or more chambers for removing the spacer is further configured for:

applying a third wet etch process to remove an oxide layer underlying the spacer.

15. The system of claim 13 wherein the first and second means for implanting are ion implantation process chambers.

16. The system of claim 13 wherein the first dry removal process is a plasma etch process.

17. The system of claim 13 wherein the one or more chambers for removing the spacer include a supply for providing perfluorocarbon gas to the first dry process.

18. The system of claim 13 wherein the one or more chambers for removing the spacer include a supply for providing H_3PO_4 acid to the second wet etch process.

19. The system of claim 13 wherein the first dry removal process uses a plasma etch with a radio frequency (RF) power less than 1000W.

20. The system of claim 13 wherein the first dry removal process uses a plasma etch with a pressure less than 300 mTorr.

21. The system of claim 13 wherein the means for forming a spacer is a chamber for performing silicon nitride chemical vapor deposition.

22. The system of claim 13 wherein the first dry removal process uses an ashing process utilizing oxygen and a fluorine-contained plasma.